PATENT SPECIFICATION 1,016,556

DRAWINGS ATTACHED.

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1,016,556

Date of filing Complete Specification (under Section 3 (3) of the Patents Act 1949): *Dec. 2, 1964.*

Application Date: Dec. 3, 1963. No. 47576/63.

Application Date: Jan. 8, 1964. No. 3706/64.

Complete Specification Published: Jan. 12, 1966.

Index at Acceptance:—B1 T(3D4, 3E2A, 3F1).

Int. Cl.:—B 01 d.

COMPLETE SPECIFICATION

Improved Gas Filtering Apparatus.

ERRATUM

SPECIFICATION NO. 1,016,556

AMENDMENT NO. 1

Page 1, Heading Application No. 3706/64 *for* "Jan. 8, 1964" *read* "Jan. 28, 1964"

THE PATENT OFFICE,
22nd March, 1966

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provided with at least one exhaust vent for the discharge of gas in a filtered condition, a series of filter elements located within the casing, each of such elements including an envelope or sleeve of permeable filtering medium and an insert of an open character which holds apart the sides or maintains the shape of the said envelope or sleeve to keep the latter open in use and yet permits of the free passage of gas therethrough, and a jet-cleaning system adapted periodically to force a cleaning gas, for example air, through the elements suchwise as to reverse the normal gas flow across appropriate faces of the permeable filtering medium.

Thus, in a gas filtering apparatus of this general kind, each of the filter elements may consist of either (a) a flat-sided pack comprising a flat, open-mouthed envelope of permeable filtering medium containing a flat insert which holds apart the sides of the said envelope or (b) a tubular or sleeve-like non-flat element, usually consisting of a cylinder or equivalent of the filtering medium fitted interiorly with means of an open character adapted to maintain the shape of the element and prevent collapse thereof.

In any event, the invention concerns gas filtering apparatus of the kind referred to and of a previously proposed form in which the machines such as conveying, grinding, cutting, polishing, sanding and many others adopted in the engineering, chemical, food and other industries for the purpose of carrying away dust-laden air from around rotary tools and other moving components of such machines.

The employment of a jet-cleaning system of the character concerned prevents filtered solids from building up on the filtering medium of the envelopes or sleeves and so decreasing the permeability of the latter. That is to say, jet-cleaning periodically restores such permeability by removing from the permeable filtering medium at least a substantial part of the retained solids.

The object of the present invention is to provide a generally improved arrangement of a gas filtering apparatus of the kind and form herein referred to designed to achieve certain advantages, as will be hereinafter described.

In the improved gas filtering apparatus provided by this invention, the filter elements are located within a sealed chamber in which is or are provided the one or more inlets for dust-laden gas, and the envelope or sleeve of permeable filtering medium constituting the outer component of each such element is open at both ends, one of these open ends communicating with a cleaned gas exhaust chamber from which gas in a filtered condition

[*Price*

is discharged, whilst the opposite open end is in communication with an impervious header so shaped or/and constructed as to provide or incorporate an inlet or inlets for the passage therethrough into the open-ended envelope or sleeve of a jet or jets of compressed high energy cleaning gas.

The impervious headers of the filter elements are all located in a further sealed jet cleaning gas chamber within which are accommodated cleaning gas pipes fitted with high energy gas distribution nozzles.

In order that the invention may be more clearly understood and readily carried into practical effect, specific constructional examples of the improved gas filtering apparatus will now be described with reference to the accompanying diagrammatic drawings, wherein.

Figure 1 is a schematic sectional view of a form of the said apparatus incorporating flat-sided filter pads.

Figure 2 is a sectional plan taken on the line II—II of Figure 1, the chamber of the apparatus not being shown in proportion.

Figure 3 is a partial vertical section taken on the line III—III of Figure 2.

Figure 4 is a fragmentary perspective view illustrating two of the headers providing narrow tubular inlets into the corresponding filter pads, and also the end connections at the opposite ends of the relevent two filter elements.

Figure 5 is a detail cross-sectional view, taken on the line V—V of Figure 1, showing the manner in which a header is adapted to provide, for the purpose of cleaning, into the relevant filter pad, a single elongated tubular inlet of venturi form, and

Figure 6 is a view similar to Figure 1 depicting a form of the improved gas filtering apparatus incorporating tubular or sleeve-like filter elements.

Like parts are designated by similar reference characters throughout the drawings.

Referring to Figures 1—5, it will be seen that the apparatus therein illustrated comprises a casing 1 having therein an inlet 2 for dust-laden gas and an exhaust vent 3 for the discharge of gas in a filtered condition (Figure 1). Within the casing 1 there is provided a series of flat-sided filter pads P which are disposed side by side in parallel spaced vertical planes. Each of the pads P includes a flat envelope 4 of permeable filtering medium and a restraining insert 5 of mesh form. The said insert is accordingly of an open character and serves to hold apart the sides of the envelope 4 to keep the latter open in use, and yet permit of the free passage of gas therethrough.

In accordance with the characteristic feature of the present invention, the envelope 4 of permeable filtering medium constituting the outer component of each flat-sided filter pad P is open at both ends *4a* and *4b* as shown more clearly in Figure 2. The casing 1 is divided, by two suitably spaced transverse partitions or plates 6 and 7, into three chambers, viz. a sealed and thus air-tight dust laden gas chamber 8 within the interior of which are exposed the upstream faces *4c* of the permeable filtering medium of the flat-sided filter pads P, a cleaned gas exhaust chamber 9 which adjoins one end of the dust laden gas chamber 8 and is in communication with the interiors of the filter pads P, and a sealed jet-cleaning gas chamber 10 which adjoins the opposite end of said dust laden gas chamber (constituting the dirty or dusty side of the apparatus) and is also in communication with the interiors of the said filter pads.

Those ends of *4b* of the envelopes 4 which are open to the sealed jet-cleaning gas chamber 10 are connected to and communicate with the interiors of impervious headers 11 shown at the right-hand side of Figure 2 and the left-hand side of Figure 3. The construction and shape of each of these headers 11, details of which can be seen in Figure 4 and will be hereinafter elaborated upon, are such as to provide, for the passage of cleaning gas into the relevant filter pad, a single tubular inlet of elongated and narrow cross-section.

The compressed high energy cleaning gas issues in the form of jets from series of distribution nozzles 12 provided at regular spaced intervals along gas pipes 13 arranged alongside the tubular inlets provided by the headers 11.

The exhaust vent side of the cleaned gas exhaust chamber 9 may conveniently be associated with means, such for instance as an electrically driven suction fan (not shown), for normally drawing gas through the inlet 2 into the dust laden gas chamber 8, through the permeable filtering medium, inwardly from the upstream faces 4c thereof, thence through the interiors of the filter pads P in a longitudinal direction away from the impervious headers 11 and finally out through the open ends *4a* of the envelopes far remote from said headers into and through the cleaned gas exhaust chamber 9. Alternatively, a fan blower or pump may be situated upstream of the filter which then vents the filtered gas to atmosphere or a ducting system connected to an outlet header.

The improved arrangement is, therefore, such that filtered gas which has been drawn through the permeable filtering medium does not normally pass through the pad headers 11 as it has done in previous arrangements. Moreover, during each filter cleaning period, compressed high energy cleaning gas emitted from the distribution nozzles 12 and forced through the tubular inlets constituted by, or incorporated in, the pad headers 11, passes into the open ends *4b* of, and flows longi-

tudinally through, the envelopes 4 in the same direction as the normal flow of cleaned gas through the said envelopes during filtering periods. To use compressed high energy gas more economically the pad headers 11 may be designed so as to allow the compressed gas to entrain some of the gas situated in the sealed jet cleaning gas chamber 10 thus giving a greater volume of gas injected into any particular pad P over a very small period of time. The gas so entrained can be supplied from atmosphere through a suitable one-way damper, or it may be taken from other pads. gas passing through some or all of the remaining pad headers 11. In short, the pad headers 11 are, according to this invention, reserved for the compressed higher energy gas flow system only, (and can be ideally designed for this condition) and this gas, although it arrests and reverses the normal flow of dust laden gas immediately across the upstream faces 4c of the permeable filtering medium, is not required to reverse all cleaned air actually within the filter pads P; on the contrary, the bursts of high energy cleaning gas push filtered gas out of the pads P through those open ends 4*a* thereof remote from the headers into the cleaned gas exhaust chamber 9—in the direction of normal gas flow. Thus, the higher energy cleaning gas initially flowing together with the filtered gas (whilst this is being pushed out of the pads P during cleaning periods) passes right through the pads, the said cleaning gas entering the envelopes 4 through the header inlets at one end and some of this gas leaving the envelopes through their opposite open ends 4*a*. During this process the speed of entry of higher energy gas is such as to create a zone of higher pressure within the pad and brings about the arrest and reversal of the normal flow of dust laden gas across the upstream faces 4*c* of the permeable filtering medium, and allows some of the high pressure cleaning gas to flow outwardly through the said medium from the downstream faces 4*d* thereof to clean the pads. This will be clearer from a consideration of Figure 2, wherein of the three filter pads P shown the central one is in the course of being cleaned by the passage of compressed high energy gas right through the corresponding envelope 4 in the direction of the arrows A, some of this high energy gas, however, flowing outwardly through the filtering medium as indicated by the arrows B to clean the pad by dislodgement of retained solids from the upstream faces 4c thereof. In respect of each of the two remaining pads P, on the other hand, gas entering the dust laden gas chamber 8 passes inwardly from the upstream faces 4*c* of the filtering medium into and through the interiors of the pads as indicated by the arrows C; in this case, i.e. during normal filtering, no gas of any kind passes into the envelopes 4 via the headers 11.

Air-tight seals 14 are provided between the open ends 4*a* of the envelopes 4 and the adjoining out-turned portions 6*a* of the transverse partition or plate 6. Similarly, air-tight seals 15 are provided between the open ends 4*b* of the envelopes and portions 7*a* of the partition or plate 7 (see Figures 2, 3 and 4).

The single tubular inlet of elongated and narrow cross-section, for cleaning gas provided by each header 11 is of a cross-sectional length, i.e., the height in this particular arrangement equal or approximately so to the width of the corresponding pad P, such inlet, as shown more clearly in Figure 5, being first of an abruptly reducing cross-sectional area from its outer edges 11*a* to its throat 11*b* so as to provide a venturi effect, and thence of a more gradually increasing cross-sectional area to its inner edges 11*c* where the inlet communicates directly with the interior of the corresponding envelope 4. The actual throat portion 11b of each venturi header may, as shown, be parallel-sided and comparatively narrow.

In any event, inasmuch as the filtered gas does not, in the improved arrangement, pass through the venturi headers 11 the invention makes it possible to design and adopt the practically ideal venturi cross-section for filter element cleaning purposes since the questions of restriction of and pressure drop in the normal flow of filtered gas do not require to be taken in consideration.

The filter pads P, in the example of the invention illustrated in Figures 1—5 may have a very thin cross section, this enabling either fore pads to be mounted within a casing of a given size, or wider spaces to be kept between pads to help in containing the dust.

The improved apparatus enables ready access to the high energy cleaning gas nozzles 12 to be made, during operation of the apparatus, without complete loss of suction inasmuch as the cleaning gas pipes 13 are housed within the sealed chamber 10 located at the ends of the pads P remote from the suction source.

The gas flow paths through the filter pads P in the illustrated arrangement are horizontally across the apparatus: alternatively, however, they may be either downwards or upwards.

As previously mentioned, the filter elements, instead of being of flat-sided pad form, may be tubular or sleeve like. In Figure 6 such an arrangement is illustrated, the filter elements, designated 16, being of cylindrical form and each provided with a cylindrical venturi-shaped head 17.

All the advantages derived from the use of a gas filtering apparatus of the form herein

referred to apply equally to the present improved arrangements of such an apparatus.

WHAT WE CLAIM IS:—

1. A gas filtering apparatus of the kind and form herein referred to, wherein the filter elements are located within a sealed chamber in which is or are provided the inlet or inlets for dust-laden gas, and the envelope or the sleeve of permeable filtering medium constituting the outer component of each such element is open at both ends, one of these open ends communicating with a cleaned gas exhaust chamber from which gas in a filtered condition is discharged whilst the opposite open end is in communication with an impervious header so shaped or/and constructed as to provide or incorporate an inlet or inlets for the passage therethrough into the open-ended envelope or sleeve of a jet or jets of compressed high energy cleaning gas.

2. A gas filtering apparatus according to Claim 1, wherein the impervious headers of the filter elements are all located in a further sealed jet cleaning gas chamber within which are accommodated cleaning gas pipes having high energy gas distribution nozzles.

3. A gas filtering apparatus according to Claims 1 and 2, wherein the casing is divided by two suitably spaced transverse partitions or plates into three chambers, viz. the air-tight dust laden gas chamber within the interior of which are exposed the upstream faces of the permeable filtering medium of the filter elements, the cleaned gas exhaust chamber which adjoins one end of the dust laden gas chamber and is in communication with the interiors of the filter elements, and the sealed jet-cleaning gas chamber which adjoins the opposite end of said dust laden gas chamber (constituting the dirty or dusty side of the apparatus) and is also in communication with the interiors of the filter elements.

4. A gas filtering apparatus according to Claim 1, 2 or 3, wherein the filter elements consist of flat-sided pads each comprising an open-ended flat envelope of permeable filtering medium containing a mesh or equivalent insert which holds apart the sides of the said envelope.

5. A gas filtering apparatus according to Claim 1, 2, or 3, wherein each filter element is of tubular or sleeve-like form comprising a cylinder or the like of permeable filtering medium fitted interiorly with means of an open character adapted to maintain the shape and prevent collapse of the element.

6. A gas filtering apparatus according to Claim 3, wherein the exhaust vent side of the cleaned gas exhaust chamber is associated with means for normally drawing gas into the dust laden gas chamber, through the permeable filtering medium, inwardly from the upstream faces thereof, thence through the interiors of the filter elements in a longitudinal direction away from the impervious headers and finally out through the open ends of the elements remote from said headers into and through the cleaned gas exhaust chamber, the arrangement being such that filtered gas so drawn through the filtering medium does not normally pass through the headers which latter are reserved for the compressed high energy gas flow system.

7. A gas filtering apparatus according to Claims 3 or 6, wherein the filter element headers are so designed as to allow compressed high energy gas forced therethrough to entrain some of the gas situated in the sealed jet cleaning chamber thus giving a greater volume of gas injected into an element over a small period of time.

8. A gas filtering apparatus according to Claim 3, 6 or 7, wherein air-tight seals are provided between the open opposite ends of the filter elements and the portions of the transverse partitions or plates in which these ends are fitted.

9. A gas filtering apparatus according to Claim 4, wherein the header of each filter pad is adapted to provide for cleaning gas a single tubular inlet of narrow, elongated cross-section, the cross-sectional length being equal or substantially so to the width of the pad.

10. A gas filtering apparatus according to Claim 9, wherein the tubular inlet of each filter pad is first of an abruptly reducing cross-sectional area from its outer edges to its throat so as to provide a venturi effect, and thence of a more gradually increasing cross-sectional area to its inner edges where the inlet communicates directly with the interior of the pad.

11. A gas filtering apparatus of the kind and form herein referred to which is constructed, arranged and adapted to function substantially as herein described with reference to Figures 1—5 of the accompanying drawings.

12. A gas filtering apparatus of the kind and form herein referred to which is constructed, arranged and adapted to function substantially as herein described with reference to Figure 6 of the accompanying drawings.

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Abingdon: Printed for Her Majesty's Stationery Office, by Burgess & Son (Abingdon), Ltd.—1966.
Published at The Patent Office, 25 Southampton Buildings, London, W.C.2,
from which copies may be obtained

1016556 COMPLETE SPECIFICATION
5 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
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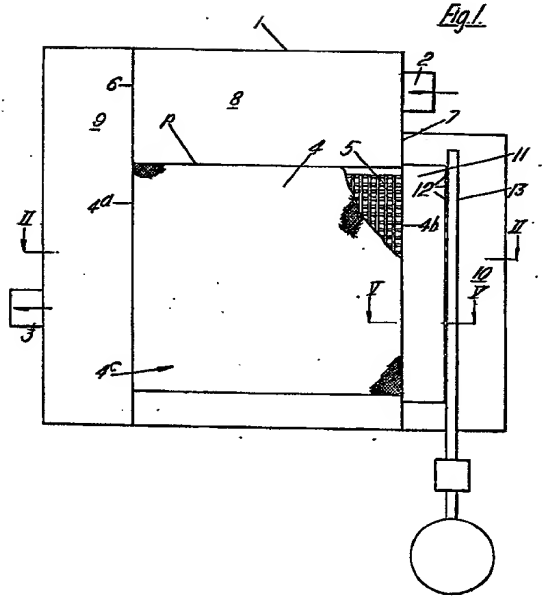
Fig.1.



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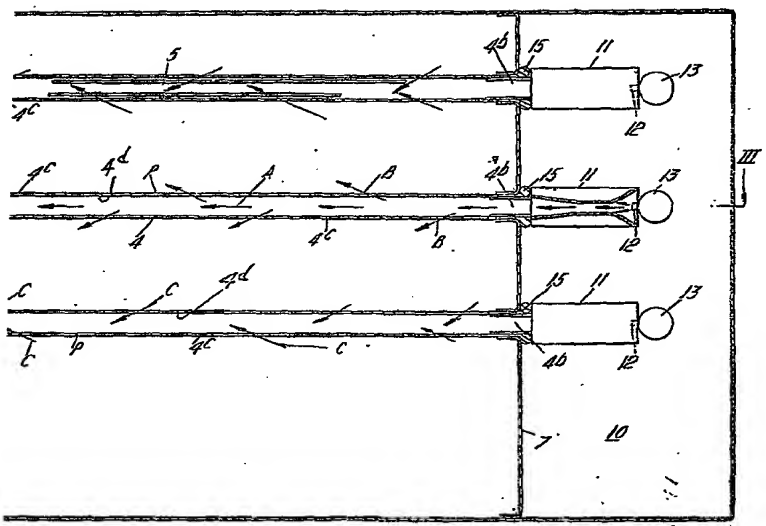
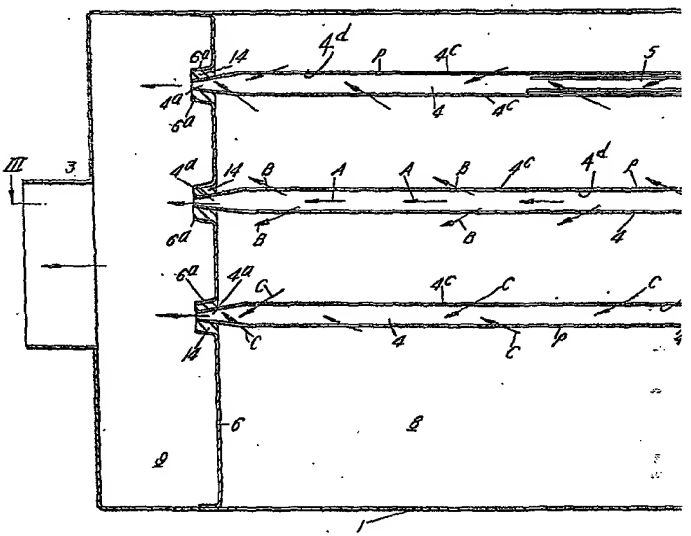
Sheet 2

Fig 2.



Fig



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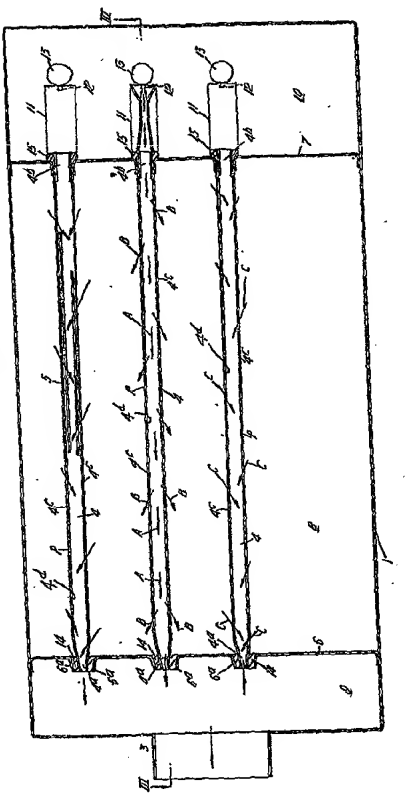
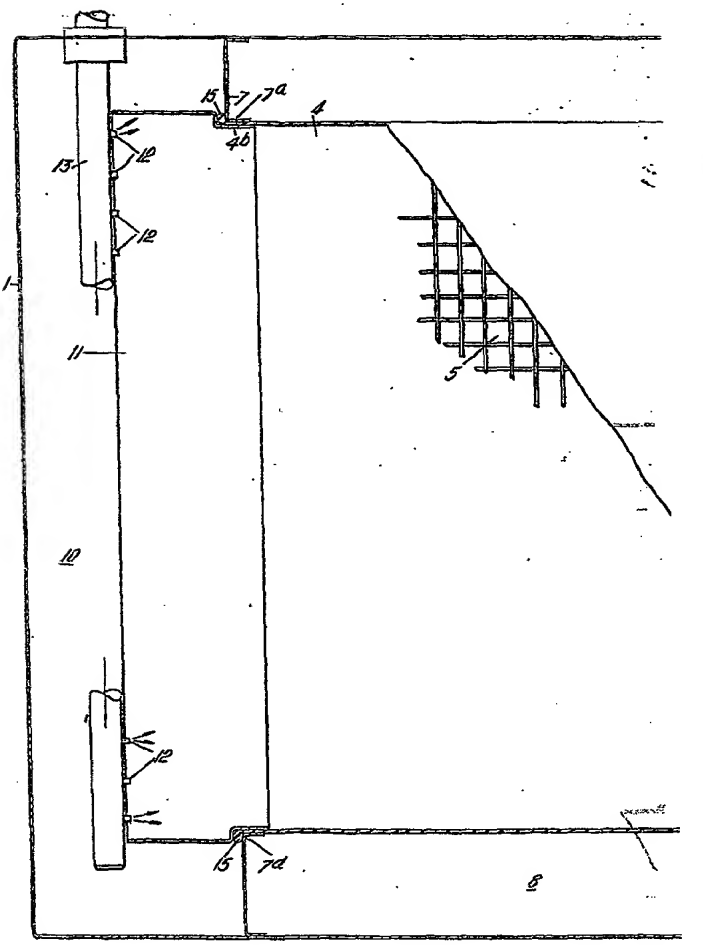


Fig 2


15
7
7a
4
4b
13
12
12
1
11
5
10
12
15
7d
8

1016556 COMPLETE SPECIFICATION
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Sheet 3

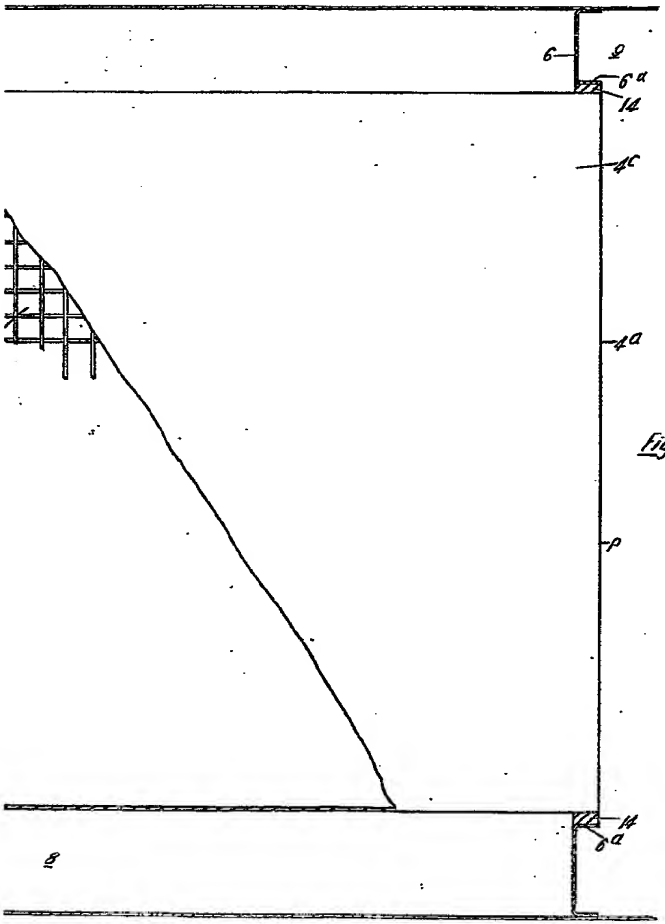

Fig.3.

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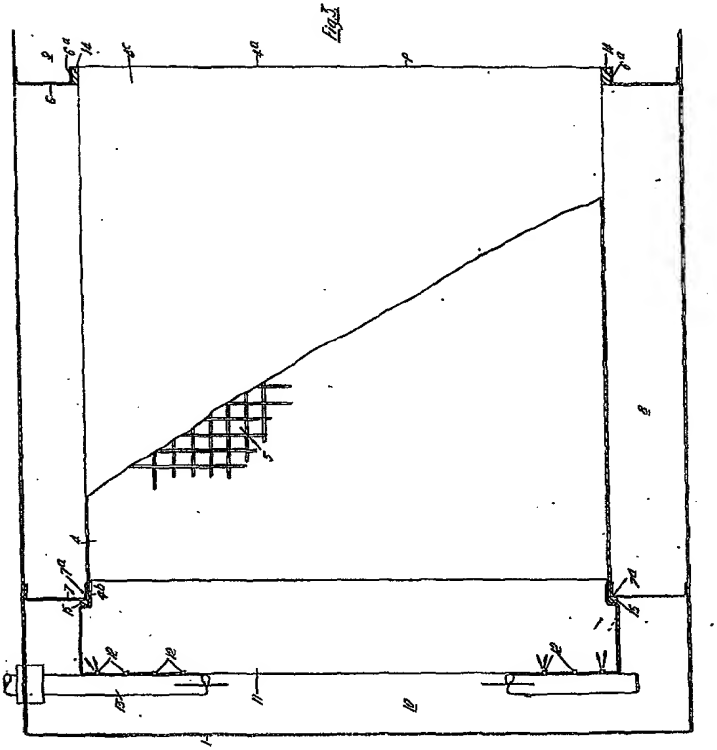
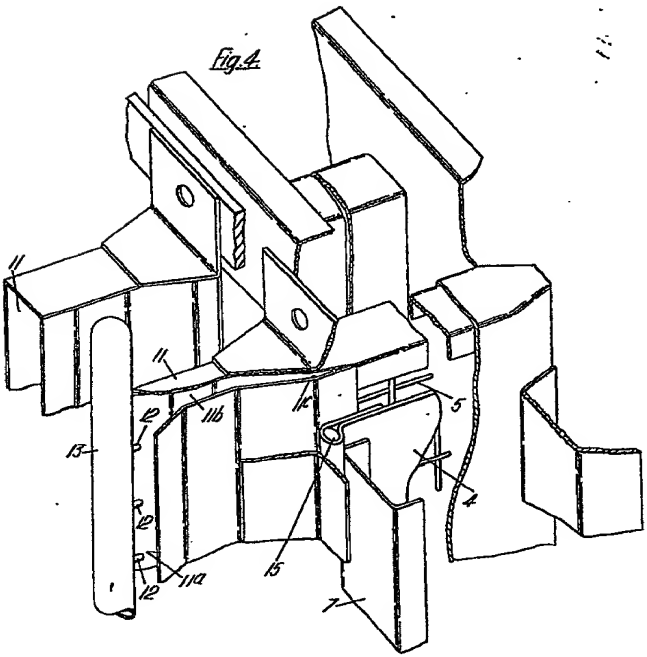


Fig.4.



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Sheets 4 & 5

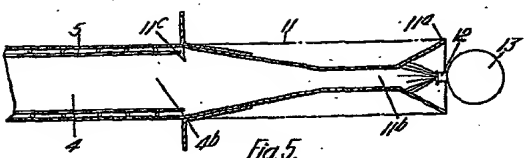
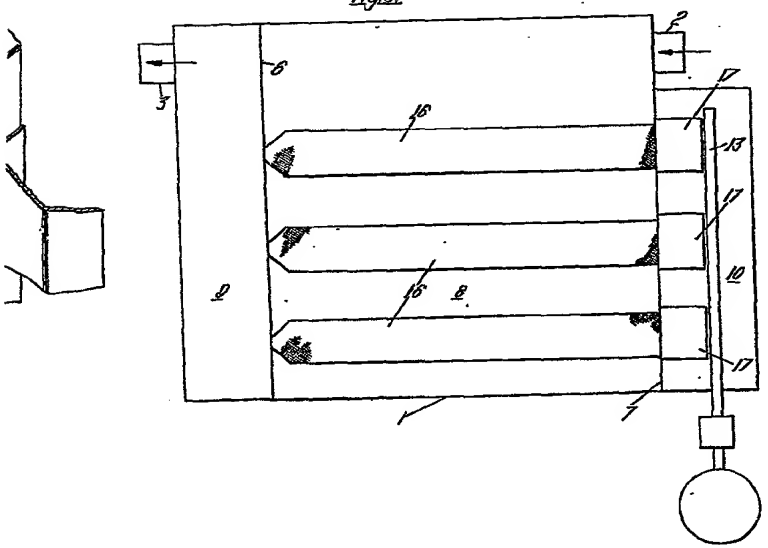


Fig.5.

Fig.6.



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Sheets 4 & 5

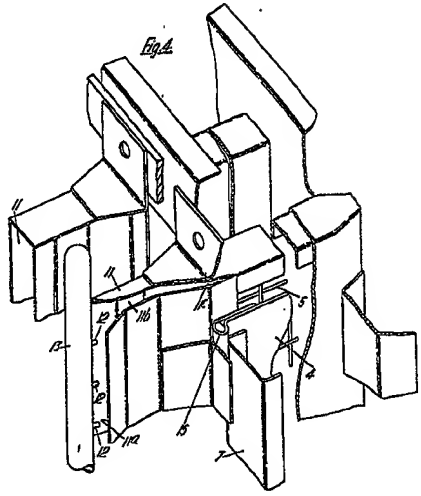

Fig.4.

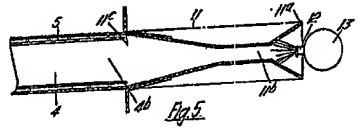

Fig.5.

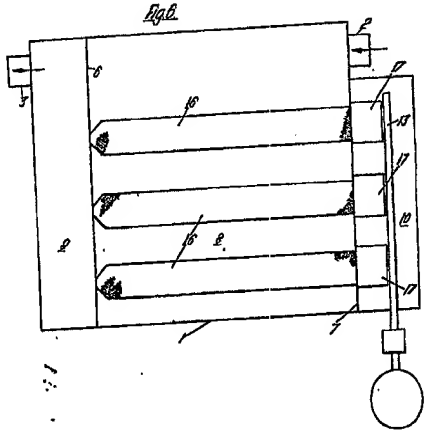

Fig.6.